Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A method of forming a photo sensor in a photo diode formed on a semiconductor wafer, a surface of the semiconductor wafer comprising a substrate with first-type dopants, and an insulating layer positioned on the surface of the substrate and surrounding the photo sensor, the method comprising:

forming a first mask layer on the surface of the substrate for defining positions of a plurality of first doped regions distributed in the photo sensor;

performing a first ion implantation process utilizing second-type dopants to form the plurality of first doped regions for increasing a contacting area between each first doped region and the substrate so as to increase a sensing area of the photo sensor;

removing the first mask layer and forming a second mask layer surrounding the photo sensor; and

performing a second ion implantation process utilizing second-type dopants to form a second doped region on the surface of the photo sensor, and the second doped region covering ~~being overlapped with a partial region~~ a top surface of each of the first doped regions and the surface of the substrate between any two adjacent first doped regions.

Claim 2 (original): The method of claim 1 wherein the dopants in the first doped regions and in the second doped region interact with neighboring substrate to form a plurality of depletion regions.

Claim 3 (original): The method of claim 1 wherein the first-type dopants are N-type, and the second-type dopants are P-type.

Claim 4 (original): The method of claim 1 wherein the first-type dopants are P-type, and the second-type dopants are N-type.

Claim 5 (original): The method of claim 1 wherein the substrate further comprises an epitaxial silicon layer, and each of the first doped regions and the second doped region are formed inside the epitaxial silicon layer.

Claim 6 (original): The method of claim 1 wherein a dopant density of the first ion implantation process is less than a dopant density of the second ion implantation process.

Claim 7 (original): The method of claim 1 wherein the surface of the semiconductor wafer further comprises a logic circuit region, and the second ion implantation process forms at least a lightly doped drain (LDD) within the logic circuit region.

Claim 8 (original): The method of claim 1 wherein the method further comprises an annealing process for driving-in the dopants in the second doped region.

Claim 9 (original): The method of claim 1 wherein each of the depletion regions formed between the neighboring first doped regions is a complete depletion region, and a capacitance of each of the depletion regions is approximately equal to zero for increasing a sensing area, decreasing dark current, and further increasing photo current and photon conversion gain.

Claim 10 (original): The method of claim 1 wherein the second doped region is utilized to be a conducting wire of the photo sensor.

Claims 11-19 (canceled)

Claim 20 (previously presented): The method of claim 1 wherein the first mask layer and the second mask layer further define positions for forming a plurality of depletion regions in the photo sensor, each of the depletion regions being located under the second doped region, between the two adjacent first doped regions, and extending under the two adjacent first doped regions.

Claim 21 (currently amended): A method of forming a photo sensor in a photo diode formed on a semiconductor wafer, a surface of the semiconductor wafer comprising a substrate with first-type dopants, and an insulating layer positioned on the surface of the substrate and surrounding the photo sensor, the method comprising:

forming a first mask layer on the surface of the substrate for defining positions of a plurality of first doped regions in the photo sensor;

performing a first ion implantation process utilizing second-type dopants to form the plurality of first doped regions on the surface of the photo sensor;

removing the first mask layer and forming a second mask layer surrounding the photo sensor; and

performing a second ion implantation process utilizing second-type dopants to form a second doped region on the surface of the photo sensor together with at least a lightly doped drain within a logic circuit region on the semiconductor wafer, and the second doped region covering ~~being overlapped with a partial region~~ a top surface of each of the first doped regions and the surface of the substrate between any two adjacent first doped regions.

Claim 22 (new): The method of claim 1 wherein the step of performing a first ion implantation process forms at least three of the first doped regions distributed in the photo sensor.